

XIX.—*Recent Discoveries in Vegetable Embryogeny.* By ARTHUR HENFREY, F.R.S., Professor of Botany in King's College, London.

THE subject of the development of the embryo of flowering plants being one of those upon which I have constituted myself a reporter, from time to time, for the pages of the 'Annals,' I find it necessary again to demand a small space, for the purpose of making known some important events which have lately occurred in the history of the question, and at the same time of putting in a distinct claim to priority in the publication of one of the most important of the latest discoveries.

It is well known to all readers of this Journal who are interested in the present subject, that I have always been an advocate for, and defender of, the opinion first put forth by Amici, that the embryo originates as a distinct cell in the embryo-sac, and is merely fertilized by the pollen-tube. Several physiologists (whose papers will be found referred to in my 'Report' published in the 'Annals' in 1852*) have argued on the same side; one of them however, Tulasne, declaring his inability to find the germinal vesicle in the embryo-sac *before* fertilization, although he distinctly asserts that it originates quite independently of the end of the pollen-tube. On the other hand, Schleiden has continued to defend his original views, and has been ardently supported by his pupil Schacht, and more lately by Deecke.

The events of the last few months have quite changed the aspect of the discussion; not only has Schleiden given his adherence to the opinion that the germinal vesicle pre-exists in the embryo-sac, but Schacht also now states that he was in error, and that the embryo is a product of a body originating in the embryo-sac, and is merely fertilized by the pollen-tube.

The merit of convincing Schleiden is due to another of his own pupils, Dr. Radlkofer, of Munich, who published at the beginning of this year some excellent observations on *Euphrasia Odontites*, and certain other plants†; and was empowered to make known therein Schleiden's acknowledgement of the accuracy of his representations. The memoir of Dr. Radlkofer did not add any new fact of importance to our knowledge, but was of much value, not only from its bearing the approval of Schleiden, but from its setting in their true light the phenomena which Schacht and Deecke had recently urged as subversive of Amici's views. Dr. Radlkofer's observations were made during

* Ann. Nat. Hist. Ser. 2. vol. ix. p. 441, &c.

† Die Befruchtung der Phanerogamen, von L. Radlkofer, M. & Ph.D. Leipzig, 1856.

last year, but did not reach me until late in the spring of this year, and were therefore overlooked in the brief summary of late researches contained in my last publication. This publication, a paper read before the Linnæan Society of London, March 4th, 1856, and reported in the 'Annals' of May following, contained the facts supporting, and the more definite assertion of, the opinion which I had propounded in the article "Ovule" (page 482) in the 'Micrographic Dictionary,' in the autumn of 1855, that the germinal vesicles (or corpuscles) exist in the embryo-sac before fecundation, *not as complete cells*, but as *corpuscles of protoplasm which acquire their cellulose coat after the fertilization by the agency of the pollen-tube.*

Entertaining this view, it was with no little satisfaction that I last week received a new paper, by Schacht (published in the Reports of the Berlin Academy for May 22nd of this year), on the "Process of Fertilization in *Gladiolus segetum*," in which he completely abandons the opinion so long and so warmly urged by him, of the origin of the embryo from the end of the pollen-tube, and not only admits the pre-existence of the embryonal corpuscles, but, in ignorance of my recently promulgated statements, describes the phænomena nearly in the same manner as I have done in *Santalum*, more particularly as regards the formation of the cellulose coat around the protoplasmic embryonal corpuscle, as a consequence of the fertilization. This corroboration of my views may be given in his own words: "In the unfertilized embryo-sac of *Gladiolus segetum* lie two germ-corpuscles, closely adherent to the micropyle-canal, the upper part of the corpuscles consisting of a bundle of delicate filaments, the lower of a mass of protoplasm. At the epoch of flowering these corpuscles are not surrounded by a firm membrane; their points project *freely* out of the embryo-sac. On the third or fourth day after the application of the pollen, the pollen-tube arrives at the germ-corpuscles and becomes intimately connected with them, and a firm membrane is developed around the latter as the first product of this conjunction. The end of the pollen-tube swells, becomes thickened, and loses its granular contents. *Both* corpuscles are ordinarily fertilized by *one* pollen-tube, but only *one* of them becomes further developed, a nucleus appearing in its plasmamass, and soon after this a horizontal septum. The first cell of the rudimentary germ produced in this way grows gradually up into the embryo, while the upper half of the original germinal corpuscle becomes the suspensor, which appears firmly connected with the wall of the embryo-sac. Not uncommonly two or three pollen-tubes descend, without producing any essential alterations; the pollen-tube sometimes branches in the

micropyle, and, though very rarely indeed, the fertilized germ-corpusele may also branch in the embryo-sac. Hence the pollen-tube exerts a *fertilizing* influence, and does not, as I formerly assumed, directly produce the germ, for the first cell of the germ does *not* originate in its interior; on the contrary, its influence causes a granular protoplasmic mass existing in the embryo-sac before fertilization to produce that cell from which both the embryo and its suspensor proceed. Those filaments (*fertilization-filaments*), of which the apices of the germinal corpuscles consist, and which I always found destitute of any power of motion, are quite essential to the act of fertilization, but they do not appear to take any direct part in the formation of the first cell of the germ." (Pp. 11, 12.)

"As to these 'filaments' I cannot say anything at present; they occur in the situation of the 'coagula' which I have described and figured in my memoir, and Schacht's drawings are not very unlike what I have seen, except that I did not detect any filamentous structure; and moreover, I do not think they project freely from the embryo-sac, although I have described them as occupying the absolute summit and exhibiting a kind of notch between them.

I must not conclude this brief notice without offering my testimony to the value of Tulasne's recent researches on this subject*. Although he has missed the most essential point, his observations are of exceeding value as contributions to our knowledge of the history of the embryo-sac and the earlier stages of growth of embryos.

London, July 30th, 1856.

XX.—On *Edwardsia carnea*, a new British Zoophyte.

By PHILIP H. GOSSE, F.R.S.

[With a Plate.]

Sp. Char. Mouth conical; tentacles above twenty-four, in three rows; epidermis subpolygonal, coriaceous, rough, brown; anterior column and posterior bulb pellucid, carneous, marked with white.

Description.—Length $\frac{5}{8}$ ths of an inch, of which the anterior column is $\frac{1}{8}$ th of an inch; diameter of body $\frac{1}{16}$ th; expanse of tentacles $\frac{1}{10}$ th of an inch.

Body enclosed in a tubular epidermis, from which the anterior and posterior extremities protrude at will (Pl. IX. fig. 1). This

* Ann. des Sc. Nat., Botanique, 4^{me} Sér. iv. p. 65.